

# Accelerating market uptake of Drone-aided medical operations through Living Labs – DALi Lab



## 1. ABSTRACT

Advances in biomedical science, data science, engineering, and technology are leading to high-pace innovation with potential to transform healthcare practices towards improved quality of life for citizens in urban and rural environments. This can be the case of drones supporting medical and healthcare services, whose implementation is expected to bring tangible benefits in short term.

However, despite drones have lived significant technological advances and the evolution of the pillars of the regulatory framework, the disruptiveness that their applications bring does not match the readiness of market and non-aviation sectors as well as the readiness and capacity of local authorities. To address this well-known issue, many stakeholders have recognised the urgent need to evolve from sandbox operational project settings to living labs settings as a way to close the gap and involve all the real-life stakeholders.

Therefore, there is a need for transition to the establishment of living labs to demonstrate to actors (market and citizens) the real-life improvements of drone-aided medical services.

DALi Lab looks for developing detailed requirements for setting up the engagement and governance structure of living labs for drone-aided medical services. This will be achieved designing an action plan to set up a living lab during the project, including testing and validation of drone solutions (real flights and simulations) for medical services for a specific use case.

At the end of the project, we will be able to provide guidance on how to develop living labs for drone-aided medical services by integrating drones on medical operations while safeguarding societal acceptance/embrace, tradeoffs and concerns about safety and security, compliance with medical protocols and the protection of individuals/patients as well as privacy and sustainability dimensions (e.g. environmental nuisance, social impacts, economic benefits).

## 2. OBJECTIVES

The main objective of DALi Lab is to provide guidance on how to develop living labs for drone-aided medical services by integrating drones on medical operations. This will be achieved designing an action plan to set up a living lab during the project, including testing and validation of drone solutions (real flights and simulations) for medical services for a specific use case.

### Specific objectives

#### **SO1 To set up the engagement and governance structure of living labs for drone-aided medical services**

**Expected results:** ■ **R1.1** Comprehensive evaluation of the feasibility, sustainability, economic viability, and societal and political implications of deploying drones in the medical sector. ■ **R1.2** A governance model defined for a drone-aided healthcare living lab. ■ **R1.3** Establishment of a clear strategic objectives for the drone-aided medical living lab. ■ **R1.4** Development of a robust and adaptable design methodology for the creation of living labs tailored specifically for drone commercial applications. ■ **R1.5** An action plan to set up the living lab and a strategy for long-term implementation. ■ **R1.6** Deployment of the engagement and governance structure of the living lab in relevant scenario (A Coruña).

#### **SO2 To align the stakes of the different market actors from the different sectors (e.g., medical, paramedical, aviation, mobility, local authorities), coordinating their activities**

**Expected results:** ■ **R2.1** Accelerate medical market uptake. ■ **R2.2** Validate a multisector technical framework drone-aided medical solutions within the living-lab boundaries. ■ **R2.3** Design a tailored Risk Assessment

framework specific to drone-aided living labs. ■ **R2.4** Demonstrate the use case. ■ **R2.5** Develop a multisector technical framework to accelerate the adoption of drone-aided medical solutions in the market.

**SO3 Gather data to support the development of future living labs for drone-aided medical services**

**Expected results:** ■ **R3.1** Increase knowledge on experimentation frameworks for testing innovations in living labs for drone-aided medical services. ■ **R3.2** Support the evolution of U-space and UAM framework.

**SO4 Define and promote best practices in the deployment of living labs for drone-aided medical services, contributing to the European leadership and Agenda 2030 (drones’ strategy 2.0) through the integration for drone-aided medical services, through different channels and forums such as the European Network of U-space stakeholders, CIVITAS, HEALTH PROC EUROPE or ECHALLIANCE related platforms, etc.**

**Expected results:** ■ **R4.1** Enhance knowledge sharing and development of best practices. ■ **R4.2** A proper multisectoral awareness, engagement and co-design plan for mitigating risks and enabling the set up of drone-aided medical living labs. ■ **R4.3** Guidelines with valuable insights and recommendations for practitioners and stakeholders involved in drone-aided medical applications. ■ **R4.4** Recommendations and best practices to decision-makers and stakeholders on facilitating the adoption of drone technologies in the medical sector. ■ **R4.5** Dissemination plan adapted to different actors. ■ **R4.6** Communication plan adapted to different actors

**SO5 Ensure the exploitation of the technologies and solutions tested in the living lab**

**Expected results:** ■ **R5.1** Exploitation strategy plan

### 3. CONSORTIUM

Capacity and role of each participant, and extent to which the consortium as a whole brings together the necessary expertise.

Participant No.	Participant organisation name	Country
1 (Coordinator)	INSTITUTO TECNOLÓGICO DE GALICIA – <b>ITG</b>	SPAIN
2	EUROCONTROL - EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION – <b>EUROCONTROL</b>	BELGIUM
3	SCIENCE AND INNOVATION LINK OFFICE S.L. – <b>SILO</b>	SPAIN
4	SERVIZO GALEGO DE SAÚDE – <b>SERGAS</b>	SPAIN
<i>Affiliated</i>	FUNDACIÓN PROFESOR NOVOA SANTOS – <b>FPNS</b>	SPAIN
5	SEVERIANO SERVICIO MOVIL SAU – <b>SERVICIO MOVIL</b>	SPAIN
6	AIRBUS Urban Mobility GmbH. – <b>AUM</b>	GERMANY
7	TOP VIEW, S.R.L. – <b>TOPVIEW</b>	ITALY
8	ENGAGE, S.R.L. – <b>ENGAGE</b>	ITALY

### 4. METHODOLOGY

DALi Lab concept is based in the relevance of the living labs as a widespread experimentation tool to co-create, prototype, test and upscale innovative solutions to (local) needs in real-life, devoted to the experimentation feature with citizen engagement throughout the process, with the main goal of explore the effect of innovation on users and society and to better calibrate the relevant requirements. The key word “requirements” plays a relevant role in defining the project methodology that bets for the efficacy of the tool, that is only possible when all the current and future requirements and conditions for the products and the services to be tested in the living lab and potentially commercialised in the market, were fully known, and considered.

DALi Lab aims at achieving the objectives presented by a three-steps methodology. (1) It will start from the

identification of the requirements from governance and technical point of view. The main goal will be anticipating future trends and conditions to be considered by any innovator player, that would be complemented by the current and potentially continuing conditions. This aspect is essential to guarantee the potential future exploitation of the results in the market and getting a relevant impact on the society. (2) At the second step, a living lab methodology will be designed taking into account the discovered requirements. The methodology will include: the process for collecting those requirements, the definition of strategic objectives, principles, governance and even management models, and other technical aspects. A demo case for the medical logistics supported by drones will be implemented under this step so the designed methodology can be tested and validated, being needed for it to define specific methodology for Risk Assessment, test monitoring and market assessment, to verify how the minimum viable product under testing is perceived by the final user, as the most relevant component of a living lab. (3) The final phase will be devoted to collect all the learnings generated during the previous step on a two-fold approach: the dynamization of innovation ecosystems from a multilevel point of view as a key condition to create and consolidate specialised experimentation practices and facilities, and the design and implementation of the concrete scheme of living lab. New practitioners will be targeted with a guidance to be supported in replication, and policy makers will be addressed with best practices and recommendations.

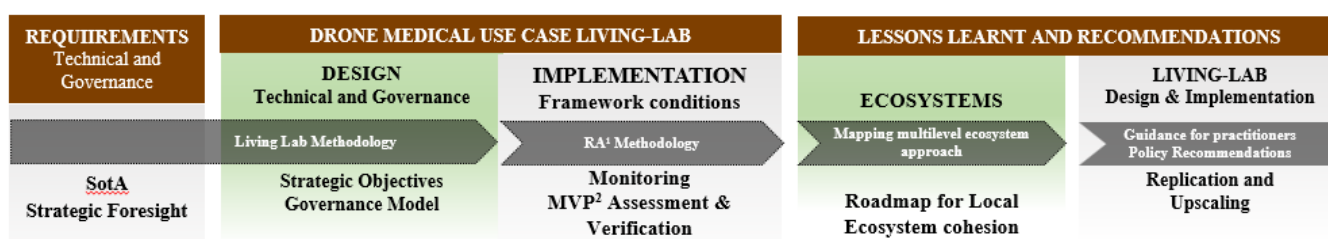


Figure 1. DALi Lab methodological concept. <sup>1</sup>RA: Risk Assessment. <sup>2</sup>MVP: Minimum Viable Product.

DALi Lab is rooted in strategic foresight principles, a growing practice in European policy development. This approach aims to anticipate trends, risks, and emerging issues to inform strategic planning and policy-making within the European Commission. The project embraces participatory foresight principles to navigate a volatile, uncertain, complex, and ambiguous (VUCA) context, emphasizing that the future is not predicted but co-created. It focuses on weak signals and encourages collaboration among societal stakeholders to shape desirable future scenarios. DALi Lab adopts a multi-layered and distributed foresight approach, examining landscape, innovation systems, organizations, and individuals. This approach is essential in cross-sectoral innovation setups like aviation and healthcare, where knowledge is scattered among stakeholders, enabling a comprehensive view of the socio-economic system. DALi Lab aims to provide an action-oriented, capacity-building approach to facilitate policy implementation and recommend cross-sectoral governance configurations for sustainable drone-aided healthcare services. The project approach begins with the European drone innovation system, connecting it with the healthcare landscape. This allows the project to address the interconnections between aviation and healthcare innovation systems. The distributed, multilayered, and participatory foresight approach aligns with regulatory requirements for multi-stakeholder engagement and governance in both aviation and medical sectors. The project encompasses various actors from local to international levels, including public and private sectors and NGOs. To manage the broad scope of DALi Lab's activities, the methodology considers how the three facets of foresight depend on context and layers of analysis, striking a balance between specificity and comprehensive coverage.

The project, driven by the goal of meeting the Sustainable Development Goals set by the United Nations, involves the application of diverse methods and tools due to its cross-sectoral and multilevel governance nature. Key actions include identifying multi-stakeholder requirements, setting targets, developing transition plans, and using various measurement and evaluation methods. The Extended Advisory Board is established to support project consortium members in implementing these activities effectively. In line with the ESG (Environmental, Social, and Governance) agenda, the living lab explores the interconnectedness of social, environmental, and economic issues, reflecting the imperative of a 'just transition' to a net-zero and equitable world. Stakeholders now consider ESG credentials alongside financial and operational performance, reflecting changing expectations and priorities.

To validate this approach, DALi Lab is focused on addressing the potential of drone-based solutions in healthcare, particularly in medical logistics. The healthcare sector has critical time-dependent needs, and the application of drones could greatly benefit areas such as organ transportation, medicine delivery, and connecting remote healthcare facilities. However, the readiness of market and industrial sectors, as well as local authorities, does not align with the disruptive potential of drone applications. The U-space regulation, which came into force in 2023, creates conditions for drone services but faces hesitations and lack of awareness from various stakeholders. DALi Lab seeks to bridge this gap by establishing living labs for drone-aided medical services, demonstrating the feasibility of this approach to align market, regulation, and technology. The project will focus on medical logistics, aiming to streamline processes such as blood sample transportation using drones within the Health Area of A Coruña and Cee (ASACEC). The project will develop a logistic use case to test all aspects of the living lab. Specifically, they aim to improve the transportation of blood samples between locations, a process that currently relies on specialized road transport and standby drivers. DALi Lab proposes a minimum viable product (MVP) technical framework that combines technologies from previous projects, including mission planning, execution, monitoring, and airspace integration aligned with EU regulatory frameworks.

## 5. WORK PLAN

The project work plan is organized in 6 Work Packages, to be deployed during 18 months and conceived in a fluent order to meet the objectives: transversal WP1 and 6 are dedicated to ensure professional management of the project and disseminate and exploit the project results, WP2 is dedicated to define the technical and governance requirements for setting a drone-aided healthcare living lab ecosystem and WP3 is dedicated to design the living lab. WP4 is intended to accelerate the medical market uptake through technology and policy /regulatory alignment. WP5 is dedicated to collect and analyze the results from WP2, WP3 and WP4 in order to define legal and regulatory requisites facilitating the living lab implementation.

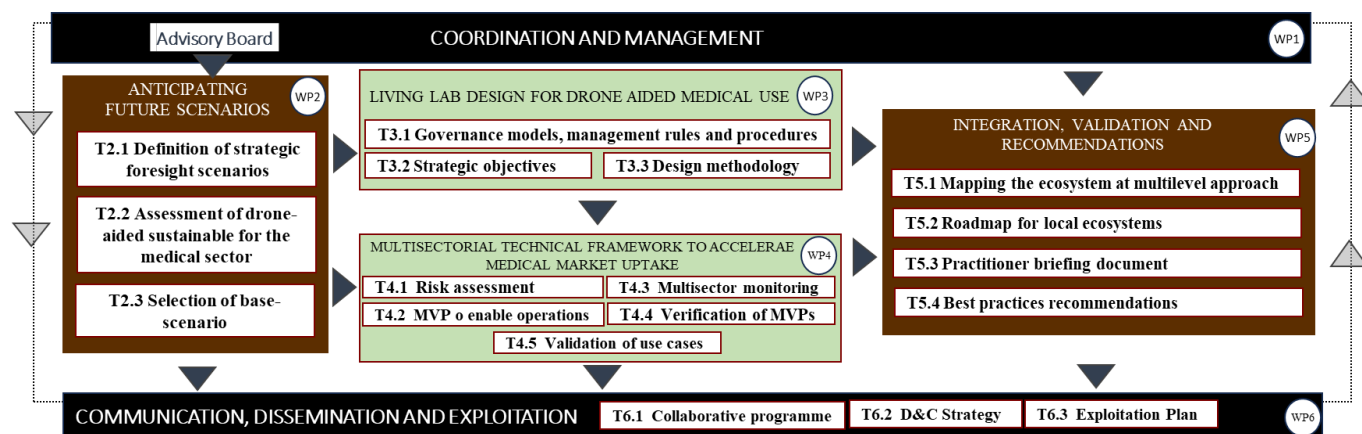


Figure 2. DALi Lab Pert Chart

## 6. EXTENDED ADVISORY BOARD (EAB)

It is an external evaluation, consultative and advisory body composed by external advisors invited to advice the Project Board on the strategy and results (Task. 1.4). Includes stakeholders affiliated to aviation safety and environmental protection, health institutions, drone users, policy makers, European platforms, local authorities and industrial consortia. The EAB will monitor and support the development of policy recommendations and regulatory actions as well as they will be actors in the framework of multi-layered and distributed foresight activities.

This board composed of different collaborators with several skills and audiences also eases the interaction within the consortium and reinforces the impact and the dissemination of the project in all covered aspects. At least 3 EAB online consultation meetings will be organized during the project lifespan, in combination with the three face-to-face consortium meetings planned.

Current size of the EAB is 16 members: **1.** UN-Habitat, **2.** Reed Smith LLP, **3.** Futures2All GmbH, **4.** CitiesNet

and e-Trikala, **5.** AESA, **6.** Spanish DGAC, **7.** A Coruña City Council, **8.** ENAIRE, **9.** ESSP-SAS, **10.** Health Ministry Regional Government in Madrid Region, **11.** ENAC, **12.** ENAV, **13.** DTA: Distretto Tecnologico Aerospaziale Apulia Region, **14.** Osservatorio UAS/AAM Politecnico di Milano, **15.** SAERCO and **16.** Alliance for New Mobility Europe.

In contact with EASA to discuss their participation if the project is awarded.

## 7. IMPACT

OUTCOME	Description
1	Increase knowledge on experimentation frameworks for testing innovations.
2	Provide services for testing innovative solutions leading to technology upscaling, reducing cost, accelerating time to the market, and reducing investment risks.
3	Enhance knowledge sharing and development of best practices between stakeholders that have been actively engaged in testing and experimentation processes.
4	Facilitate the deployment and potential commercialisation of new innovative solutions.
5	Identify areas where the multi-sectoral and/or emerging nature of some innovations requires coordinated action by innovators and regulators.
6	Identify legal, regulatory, fiscal, technical, and operational pre-requisites or barriers for different use-cases which hamper the development of innovation.
7	Explore areas where the European supervisory authority exists and pan-European testing might be desirable.
8	Enhance linked inclusive, and more efficient innovation ecosystems across the EU.
9	Enhance cross-border network connectivity and inter-regional collaboration of regional innovation valleys.
10	Strengthen and expand cooperation between innovation ecosystems worldwide
11	Foster more inclusive and gender equal innovation ecosystems
12	Reducing territorial inequalities in access to innovation support

## 8. DISSEMINATION & COMMUNICATION

The dissemination and exploitation activities will be managed in WP6. It is essential that the results of the project are effectively disseminated and exploited, so that the partners and all external stakeholders benefit from them. This section will outline an initial strategy to achieve it. The dissemination- and exploitation-related activities of **DALi Lab** project will be carefully orchestrated so that they support each other and allow the project output to be readily disseminated and prepared for exploitation. We will identify the various stakeholders from the onset of the project, as this will allow for an efficient dissemination strategy in the long term. To maximise this impact, **DALi Lab** will have a clear and actively managed dissemination and exploitation plan of project results to achieve the objectives. At this stage, **an initial draft plan has identified main objectives, stakeholders, materials, means, and concrete actions to be developed during and after the project.** Among other activities, we will carry out the following ones:

- Webpage and Corporate image
- Press releases to general public
- Peer-reviewed papers by the scientific partners in open-access journals.
- Webinars and conferences
- Midterm and final conferences for results dissemination
- Clustering with other projects/entities/platforms to reinforce DALi Lab expected impact
- Dissemination activities, including EAB tasks